A New Look at an Old Practice

BY MICHAEL JAZZAR

Inquiry training is a powerful teaching model for principals to know and teachers to implement (Ascher, 1991). First formulated by Suchman in 1962, inquiry training is designed to teach students to engage in causal reasoning and to become more fluent and precise in asking questions. Further, inquiry training helps learners build concepts and form and test hypothesis. Inquiry training originated in the natural sciences; however, it has been powerfully integrated into all curricula areas and in training programs with personal and social content.

Recent research reveals that "with the diverse student populations within our schools it has become necessary for teachers to have various approaches to instruction" (Ladson-Billings, 2001). Dave Thaden, principal of East Chapel Hill (NC) High School, describes the absence of inquiry training and other learning models as disabling: "The preoccupation with rote memorization for statewide test preparation has meant a tremendous loss in teaching students critical thinking skills. Schools that are so wrapped up in high-stakes testing emphasize the importance of pieces of information as if it were a game of Trivial Pursuit with statewide tests being deified."

PREVIEW

The emphasis on test performance and accountability makes inquiry training a necessary model for teaching higher level skills.

Summer Science Scholars is one example of how an inquiry-based model can help students who struggle with traditional instruction perform better and learn more.

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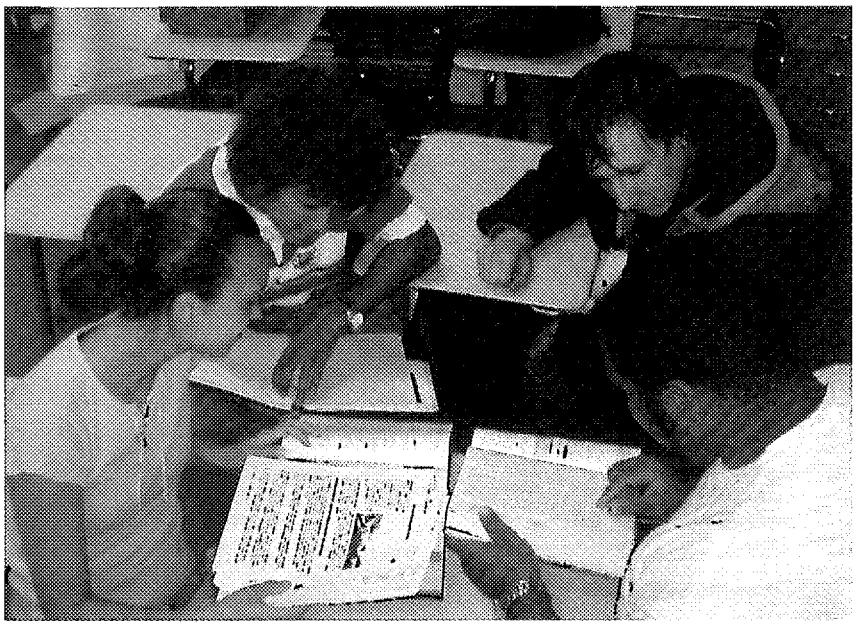
Inquiry is based on a natural science model that begins with intellectual curiosity and moves toward discovery and critical thinking.

Dan Meehan, principal of Northwest Cabarrus High School in Concord, NC, emphasizes the importance of principals assuming the role of instructional leader, saying, "If student achievement is to significantly increase on statewide tests, principals need to be directly involved in the improvement of instruction." Marcoulides and Heck (1993) found that the instructional leadership provided by a principal in shaping instructional practices and organizing the instructional program are significant predictors for academic achievement. The formula is clear: For increased student achievement, principals need to provide the kind of instructional leadership that encourages teachers to use various models of instruction, such as inquiry training, to enhance the learning opportunities for all students. According to Newman and colleagues (2000), "Inquiry training is ideal for students with disabilities such as attention deficit disorder, attention deficit hyperactivity disorder because it allows for active mental and physical involvement. Inquiry training would be ideal for students who historically have a difficult time maintaining focus within the traditional classroom." It has also been noted that teachers can reach students "who are currently hostile toward today's curriculum" by using a variety of instructional methods (Gooding, 2003).

A Sample Lesson

When engaged in the process of inquiry, students increase their understanding of subject matter, productivity in creative thinking, and skills for obtaining and analyzing information. Inquiry training works best when confrontations are strong, arousing genuine puzzlement, and when materials the students use to explore the topics under consideration are especially instructional (Ivany, 1969). Students at all levels,



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Students who read *The Butterfly* test their hypothesis about the results of war by analyzing historical documents and artifacts.

preK through grade 12 and beyond will benefit from inquiry training. The significant gains of inquiry training are illustrated in the following scenario:

The students are reading *The Butterfly* by Patricia Polacco, a book about a young Jewish girl who hid from the Nazis in France during World War II. While students are reading about the young girl and her trials, they are recording statistics about France during WWII, such as the number of bombings on given cities; the number of dead during various time periods; and the changes in economic conditions in France, Germany, the United States, and England. The students wonder what would have been like to live under the conditions Butterfly experienced.

To capture this interest, the teacher formalized the inquiry by asking the students what they thought it was like living in France, Germany, England, and the United States during this time. The students hypothesized that the United States and England would have been least changed because the ground fighting was primarily in France and Germany. The class discussed which aspects of life—such as daily activities, school, shopping, travel, media, clothes, and so forth—may or may not have changed.

After an initial period of practice in teacher-structured inquiry sessions, the students were divided into groups and each group was assigned one of the four countries. Each group was then provided artifacts including books, relics, photographs, and names of individuals to interview. Each group researched the provided artifacts. When they completed their investigation, the class as a whole recorded their findings on the board in a matrix. The students discovered that all of the countries were affected in different ways and to different degrees. The students concluded that proximity to a battlefield does not mean that more basic needs are deprived. Students felt that the allies in a war also are affected by providing resources and manpower.

As a culminating activity, students wrote and performed a play illustrating what they learned through inquiry training. Students then analyzed the process of inquiry learning and made recommendations for similar upcoming learning opportunities.

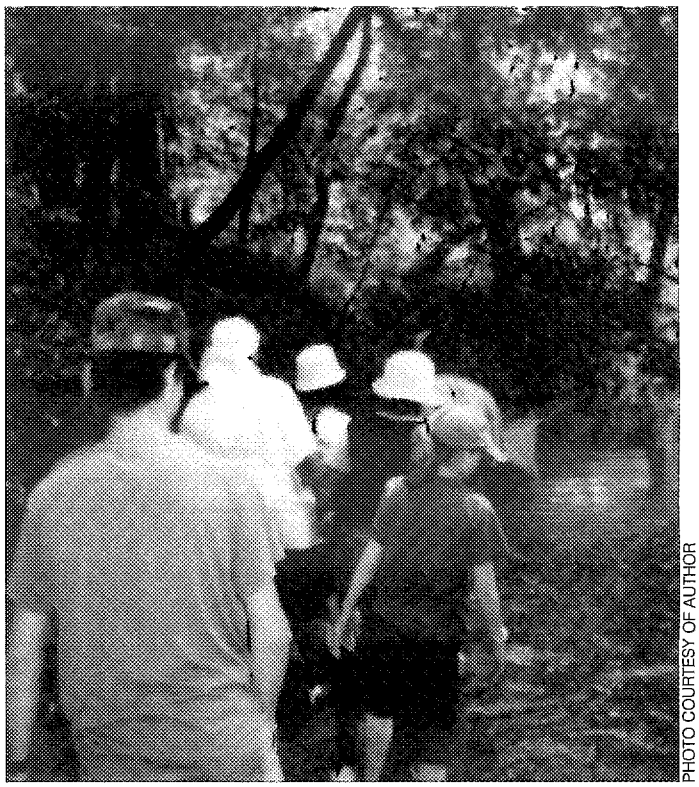
The Five Steps

As *The Butterfly* lesson illustrates, the first step of the five-step process of inquiry training begins when the teacher presents students with a puzzling situation or event and only verifies facts and does not become part of the inquiry.

1. The students reading *The Butterfly* were presented with the challenge of how the people living in France, Germany, England, and the United States were affected during WWII under the conditions Butterfly experienced.

2. Students are asked to gather information and verify the occurrence of causal relationships. In the Butterfly scenario, students were divided into groups and each group was

The Summer Science Scholars program immerses students in the real scientific endeavor of studying water quality and successfully engages them in their learning.



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Summer Science Scholars: Inquiry in the Field

By Linda S. Shelton and Michael Jazzar

It's a hot June morning, and several students are grouped along the banks of a North Carolina stream. Some of the students are wading into the shallow water, sifting through the swiftly moving currents searching for aquatic flora and fauna. Those on land are conducting chemical tests of the water and recording data in their journals. These teenagers are engaged in an exciting inquiry learning opportunity called "Summer Science Scholars."

Students are selected to participate in Summer Science Scholars by the teachers at Northwest Cabarrus High School in Concord, NC, and are chosen on the basis of their potential, not GPAs or test scores. Northwest has provided this full-month learning opportunity for the past three years.

Summer Science Scholars is an inquiry-based program that has turned students on to learning. Students are given a real problem to solve—such as testing for safe drinking water or saving the lives of fish—that has relevance to them personally. Students in the program tend to apply themselves fully, and they are not content to simply do the chemical analysis and report their findings—they chose to report their findings to the authorities themselves.

It is very exciting to see students who sat in science classes and did very little all year rush into the lab each morning to get a few chemical tests finished before journeying to the stream for another day of research. When these budding scientists take ownership of their studies, they actually push the teachers for more to do. Students do not want the answers given to them. They seek directions on how to search for the answers themselves.

Students who participate in Summer Science Scholars generally return to school in the fall with a more positive attitude toward studies. The majority of Summer Science Scholar participants so far have shown a marked improvement in their grades. The most noticeable change, however, is the boost in their self-esteem as a result of the positive inquiry learning experiences. The students' increased self-esteem improved their perception of school, which in turn improved their achievement. Students who were never leaders before assumed leadership roles in the summer program because of the inclusive nature of inquiry learning. They returned in the fall with a desire to take a greater leadership role in their school.

The students in the 2003 Summer Science Scholars program included two students who were perceived by teachers to be on the "drop-out path." Both students were fascinated to discover that they could have a career doing the kind of water testing that they enjoyed through Summer Science Scholars. When the manager of the county water system addressed the Scholars, both students talked to him at great length. Both students took leadership roles during the summer program and by the last week were asking what kind of schooling they would need to work in this field. When they found out they could earn the requisite certification from a community college, they were determined to succeed.

Such examples remind all of us that students of all abilities are naturally curious. If they are confronted with an interesting problem or unexplained phenomena, they will work endlessly to know why. Helping students experiment to satisfy their curiosity and creativity in such productive ways will develop lifelong skills. Inquiry has the exciting potential of tapping the wealth of curiosity, energy, and enthusiasm of all students. Then, and only then, will student achievement will be maximized.

Nancy Barkemeyer, Northwest's principal, is a believer in Summer Science Scholars. She said, "We have seen great improvements in the attendance of Summer Science Scholar participants. Their outlook on school has changed. The students have a new understanding of the importance of learning. It was empowering for the students to share what they learned at Summer Science Scholars with our School Board."

Summer Science Scholars operates on a shoestring budget, yet it is totally free to the students. By running simultaneously with the academic summer school, the Summer Science Scholars program takes advantage of the already running buses, which have ample available seats. The Cabarrus County School Board was impressed with the magnitude of the learning and how student's lives were turned around with all of this accomplished on a shoe-string budget. Summer Science Scholars will continue to provide inquiry-learning opportunities in the upcoming years.

***Linda S. Shelton** has taught for 13 years in secondary education and has been a master teacher with SciLink and a leader in science education. She originated Summer Science Scholars to curb drop-out rates and increase student achievement. She has a degree in zoology.*

When interaction among students is encouraged, the intellectual environment is open to all relevant ideas where all participants engaged in inquiry learning become active learners....Inquiry learning prepares today's students for the information age of the 21st century where collaboration is a necessary skill.

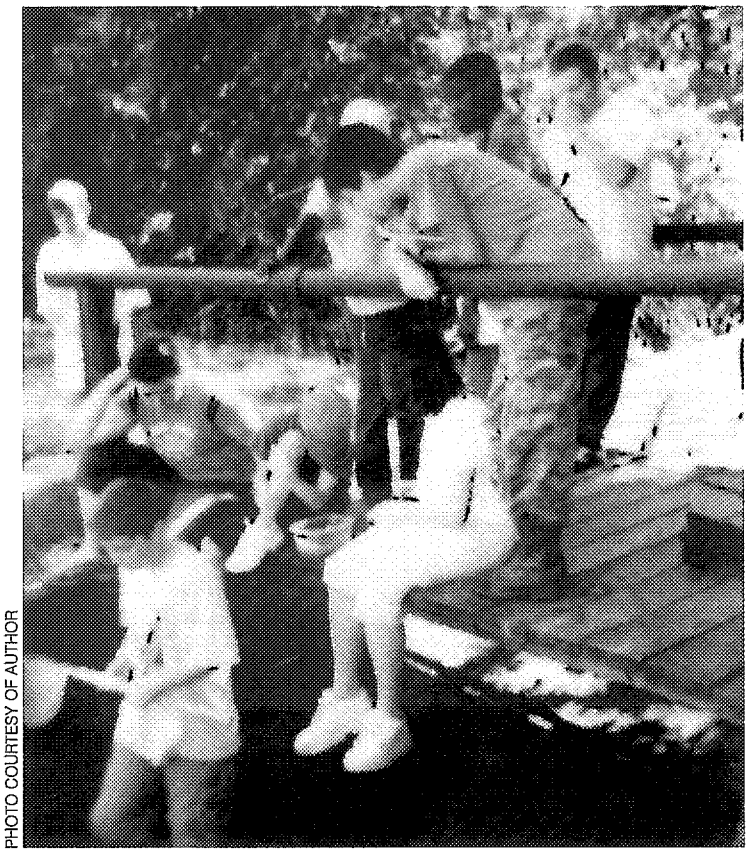
assigned a country and given artifacts so the students could conduct an investigation of the impact of WWII.

3. Students identify relevant variables, hypothesize, and test casual relationships. When their investigation was completed, students recorded their findings, formed conclusions, and tested their original ideas about the proximity to battlefields.

4. The teacher asks students to organize the data and formulate an explanation for the puzzle. The explanation in the Butterfly scenario was revealed in a culminating activity, a play illustrating what students learned.

5. Students analyze their pattern of inquiry and propose improvements. In the Butterfly exercise, students analyzed their learning process and made recommendations for improved inquiry learning.

The Science Scholar students are encouraged to work together to collect data and analyze problems.



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An important distinction of inquiry learning as reflected in the above scenario is that the teacher provided exciting opportunities for students to inquire, investigate, conclude, and revise—all critical thinking skills. Once these critical thinking skills are honed by students, they will be able to master all academic challenges placed before them, including statewide tests.

Inquiry training transforms the roles of teachers and students. Students are placed in the roles of researchers practicing the lifelong skills of cooperation, intellectual curiosity and freedom, and collaboration. The new roles and responsibilities of the teacher include:

- Asking students to rephrase the questions
- Pointing out items needing further validation—for example, "We have not established that this is liquid"
- Using the language of the inquiry process, such as identifying student questions as theories and inviting student testing (experimenting)
- Providing a free intellectual environment by not evaluating student theories
- Challenging students to make clearer statements of theories
- Providing support for student generalizations
- Encouraging interaction among students

When interaction among students is encouraged, the intellectual environment is open to all relevant ideas where all participants engaged in inquiry learning become active learners. Students learn the benefits of a learning community in which everyone works together to solve common problems. Inquiry learning prepares today's students for the information age of the 21st century where collaboration is a necessary skill.

Additional Benefits

Inquiry training demonstrates the natural way to learn because it helps students develop open-mindedness and the ability to balance alternatives. "Utilizing models such as inquiry training increases all students' ability to think independently; therefore it is critical that teachers use such models on a daily basis" (Darling-Hammond, 1997). Students learn to explore problems from a variety of perspectives and begin to understand that a problem

may have many possible solutions. Specifically, inquiry learning helps students develop the following strategies:

- Observe, collect, and organize data—process skills
- Identify and control variables
- Formulate and test hypothesis and explanations
- Think creatively
- Learn independently and autonomously
- Express thoughts verbally
- Tolerate ambiguity
- Persist
- Think logically
- Understand that all knowledge is tentative.

Each of these strategies is important in a world-class education where global awareness and sensitivities toward one another are necessary. Self-discovery is exciting, engaging, and empowering; however, it is implemented all too infrequently in schools. Teaching students how to think increases their achievement on all indicators.

The Final Word or Two

For the sake of all students, principals must work diligently to provide a school environment where teachers receive the appropriate staff development and the encouragement to use inquiry training and other research-based models, where decisions are driven by research, and where pride and success for the meaningful learning of all students prevail. **PL**

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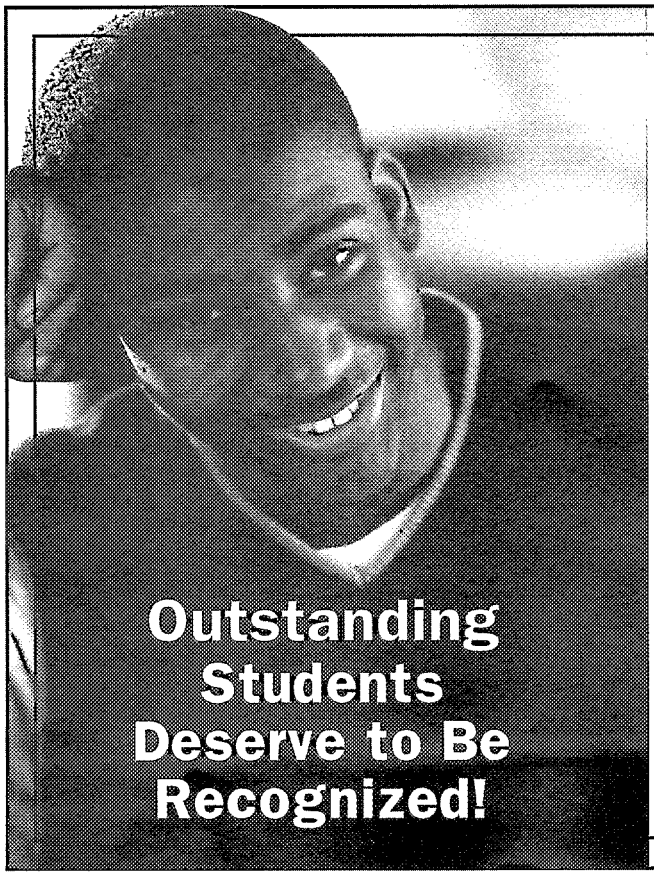

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